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Patents ADP number (if you know it)

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4. Title of the invention 6208193006

NETWORK ARRANGEMENT FOR COMMUNICATION

5. Name of your agent (if you have one) PAGE WHITE & FARRER

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

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NETWORK ARRANGEMENT FOR COMMUNICATION

Field of the Invention

5 This invention relates to a secure method and network arrangement for communication.

Background to the Invention

10 Subscribers of communication services on fixed or mobile networks register terminals for use within a given network with the operator of that network. The network operator can thus deliver relevant subscriber services and support call origination and delivery for that registered terminal. For
15 example, following user registration, the network can perform connection set up, call routing and billing functions. Where a subscriber is mobile and visits another network, communication services may still be available by means of roaming agreements between the network operators.

20 Internet applications and particularly wireless Internet applications have been proposed which allow subscribers of secure local networks to choose between communication routes which are deemed relatively secure and alternative
25 communication routes which are inherently less secure. The Internet is regarded as providing insecure communication routes, particularly when compared with traditional communication networks such as a fixed-cable telecommunication network or a mobile telecommunication network. Accordingly,
30 if a terminal located in a first secure network wishes to communicate with a terminal located in a second secure network, the intermediate communication route can either be secure or insecure. For example an intermediate network such as the PSTN or ISDN networks would be deemed relatively
35 secure. However, an intermediate network incorporating the Internet would render the communication route insecure.

Where an insecure network is used the originating and destination end terminals may use an encryption technique.

5 Applications for implementing the chosen encryption technique
need to be provided at both the originating and destination
end terminals. In practice, situations arise where a plurality
of end terminals in one network wish to communicate with a
plurality of end terminals in another network and mutually
10 compatible encryption applications must be provided to each of
the plurality of end terminals.

Security services employed on fixed and mobile networks
include encryption, certification and authentication.
15 Encryption, for example, typically employs systems based on
key pairs. That is, before transmission a subscriber protects
the transmission by running an encryption application on the
originating end terminal using a key. The transfer is made
with the content of the message in an encrypted (protected)
20 format. At the destination end terminal, the message is
decrypted by running a mutually compatible decryption
application also with a key.

One well known type of encryption application employs a
25 "private/public key pair system", where the originating
subscriber protects his transmission using a private key and
the message is then transferred via an intermediate network to
an end terminal where it can be decrypted by the destination
subscriber by means of a public key. This system requires that
30 the originating subscriber makes the relevant public key
available to the or each destination subscriber. Subscribers
do not usually make private keys available. Options for making
public keys available to destination subscribers include, for
example, email or posting the key on web sites which are
35 accessible to destination subscribers. Although the keys are
available to the intended recipients, this system is
inconvenient and vulnerable to those who are intent on
obtaining public keys for deciphering messages not intended
for them. Imitation (hoax) web sites have been used to
40 manipulate such arrangements.

5 Another type of key system employed in encryption applications
is the "shared secret key pair system". This system requires
that the originating subscriber protects his transmission
using a secret key and the terminating subscriber uses the
same key (shared secret key) to extract the message
10 information. This system differs from the private/public key
pair system in that it requires that each receiving subscriber
has access to the senders secret key. This arrangement is only
acceptable where there is a high degree of trust between
originating and receiving subscribers and secure networks
15 therebetween.

In general, encryption techniques require that both the
communicating end terminals of the subscribers have access to
the relevant encryption/decryption algorithms/keys etc. The
20 communicating end terminals must also be provided with and be
able to run a suitable application. Any changes or
modifications to the encryption technique at the originating
end must be provided to the relevant terminal at the receiving
end.

25

Summary of the Invention

Embodiments of the present invention seek to address the
problems outlined hereinbefore.

30

According to an aspect of the present invention there is
provided a secure network arrangement for communication
between a first end terminal located in a first secure network
and a second end terminal located in a second secure network,
35 said first and second networks being separated by a relatively
insecure intermediate network, the secure network arrangement
including: one or more network elements triggerable to
selectively route a communication from the first end terminal
to the second end terminal over said relatively insecure
40 intermediate network; and an encryption engine for encrypting
said selectively routed communication before it traverses said

5 intermediate network, wherein said one or more network elements and said encryption engine are located substantially within said first secure network.

10 Preferably the one or more triggerable network elements comprise a switch means provided with a control means, and a storage means for storing routing and encryption/decryption information. The switch means can selectively route a predetermined type of communication according to routing information held in the storage means and the encryption
15 engine is operable to encrypt said selectively routed communication according to encryption information held in said storage means.

20 In a preferred embodiment, said predetermined types of communication are identified by means of one or more of the following triggers set up in the switch means: recognition of originating subscriber characteristics; recognition of destination subscriber characteristics; recognition of payload characteristics or recognition of network service
25 characteristics. Preferably, the encryption information held in the storage means defines a preferred algorithm or key for use with said predetermined types of communication. In addition, the information held in the storage means can identify one or more groups of users whose communications are
30 to be routed and encrypted according to common preferences.

According to a second aspect of the present invention there is provided a method for secure communication between a first end terminal located in a first secure network and a second end
35 terminal located in a second secure network, said first and second networks being separated by a relatively insecure intermediate network, the secure network arrangement including: one or more network elements triggerable to selectively route a communication from the first end terminal
40 to the second end terminal over said relatively insecure intermediate network; and an encryption engine for encrypting

5 said selectively routed communication before it traverses said intermediate network, wherein said one or more network elements and said encryption engine are located substantially within the first secure network.

10 Brief Description of Drawings

For a better understanding of the present invention and to understand how the same may be brought into effect, reference will now be made by way of example only to the following
15 Figures in which:

Figure 1 schematically illustrates examples of alternative communication routes between a first end terminal in a first network and a second end terminal in a second network;

20 Figure 2 schematically illustrates a preferred method for communication between first and second end terminals located in secure networks and separated by an insecure network;

25 Figure 3 schematically illustrates the method of Figure 2 applied to communication to and from a roaming mobile terminal;

Figure 4 schematically illustrates a preferred method for the
30 distribution of encryption information; and

Figure 5 schematically illustrates a second method for the distribution of encryption information;

35 Description of Preferred Embodiments of the Invention

The term "encryption" used herein can refer either to direct encryption of the IP payload, possibly with addition of an encryption header, or tunnelled payloads (i.e. not only
40 encrypting but adding a further network header to address the encrypted packets to a known tunnel end point). The term is

5 also used in a broader sense to refer to general compression techniques.

Figure 1 shows a first end terminal 10 wishing to communicate with a second end terminal 12. The originating end terminal 10 is in a first network (A) controlled by a first network operator and the second end terminal 12 is located in a second network (B) controlled by a second network operator. The networks (A) and (B) may be fixed or mobile networks operated by trusted network operators and are thus deemed relatively secure. The networks (A) and (B) are separated by intermediate networks which, in this example, include a public switched telephone network PSTN 16 and the Internet 22. Whereas the PSTN 16 could be regarded as a relatively secure intermediate network for transfer between the end terminals 10 and 12, the Internet 22 would be regarded as an insecure network.

Switch 14 represents a general service switching point, for example a mobile switching centre (MSC) or any suitable telecommunications switch or routing element. Communications can occur between the first end terminal 10 and the second end terminal 12 via a secure intermediate route indicated by arrows 19, shown here as via the PSTN 16. Alternatively, communication between the first and second end terminals 10 and 12 can occur via an insecure intermediate route indicated by arrows 20, shown here as including the Internet 22.

Referring now to Figure 2, a first preferred method for communication provides a secure network arrangement including a network element which permits the construction of a tunnel through the insecure network between first and second end points within the secure networks of the originating and terminating end terminals, respectively. The effect is to create a virtual private network (VPN) for secure communication between the two terminals 10 and 12. A group of logically associated intelligent network elements 30 are

5 provided in a secure network between the first end terminal 10
and the terminating end terminal 12. In this example, the
intelligent network elements 30 are provided in the network
(A) of the originating end terminal 10. The intelligent
network elements 30 can communicate with end terminal 10 and
10 also communicate with an encryption engine 40 in the first
network (A).

The intelligent network elements 30 include a service
switching point (SSP) 32, a service control point (SCP) 34 for
15 providing an intelligent function, a service data base (SDB)
36 for storing subscriber profiles and an intelligent
peripheral (IP) 38. The service switching point 32 can
transfer messages from and/or to the first end terminal 10 and
one or more of the intermediate networks 16,22. The service
20 switching point 32 is connected to the service control point
34 which has processor functionality and access to the service
database 36. The intelligent peripheral 38 is connected to
the service control point 34 or possibly directly to the SSP
32.

25

To communicate with either of the intermediate networks, the
service switching point 32 can transfer messages to and/or
from either the PSTN 16 or the encryption engine 40 which
defines a first end point of a tunnel 41 through the Internet
30 22. A further switch 18 is provided in the second network
(B). The switch 18 is connected to each of the intermediate
networks, namely the PSTN 16 and a second end point 42 of the
Internet tunnel 41, and with the second end terminal 12. Note
that the encryption engine 40 defining one end point of the
35 tunnel 41 and the other end point 42 of the tunnel 41 are
located in the first and second secure networks (A) and (B),
respectively. The tunnel 41 is thus constructed as a secure
passageway for transfer through the Internet 22.

40 The intelligent network elements 30 enable the operator of the
first network (A) to offer subscribers a secure communication

5 route over a usually insecure network. This is achieved by
intelligent management of route and encryption techniques in
respect of specific subscribers or groups of subscribers. In
a situation where the first end terminal 10 wishes to
communicate with the second end terminal 12 via the Internet
10 22, the first terminal 10 originates the communication and
follows call access 50 and call set-up 52 procedures.
Typically the end terminal 10 transmits both an identification
number and a destination number on a control channel. The
service switching point 32 receives the information from
15 terminal 10 and can refer to the service control point 34 in
response to a predetermined trigger. The type of trigger
employed can vary but will generally be set-up such that the
intelligent network elements 30 provide the subscriber of the
end terminal 10 with his preferred network service. For
20 example, the service switching point 32 can be set up to refer
to the service control point 34 in response to a trigger being
set, for example, on the network address of the originating 10
or terminating 12 end terminals, on flow ID which is an
identity associated with a succession of packets and/or or on
25 payload information. In this example, the trigger is set to
respond to a characteristic of the destination number. In
other embodiments, the service switching point 32 may
recognise a range of numbers in the originating ID number,
and/or destination number or may respond to prepaid only,
30 voice only, data only messages, and be dependent on time-of-
day etc. This list of possible triggers is obviously not
exhaustive.

When a referral by the service switching point 32 to the
35 service control point 34 has been triggered as described
above, the service control point 34 accesses the relevant
subscriber profile stored in the service database 36. The
subscriber profile contains subscriber specific information
including information regarding the network services paid for
40 by each subscriber or group of subscribers. In this example,
the subscriber profile contains subscriber specific routing

5 and encryption information which is taken into account
whenever a trigger is determined. The information stored in
the service database 36 may include one or more preferred
encryption algorithms (or compression algorithms etc.) and/or
keys. Subscriber specific profile information is then
10 returned to service switching point 32 via service control
point 34 and the transfer is routed as appropriate. If the
subscriber in question prefers communication between the first
network (A) and the second network (B) to go via the PSTN 16,
the profile information will indicate this and the service
15 switching point 32 will direct the transfer accordingly.
However, if the subscriber in question prefers communication
between the first network (A) and the second network (B) to go
via the Internet 22, then the service switching point 32 will
redirect the communication to the encryption engine 40 where
20 the message content is automatically encrypted using an
algorithm. In this example, the preferred algorithm is part
of the subscriber specific information specified in the
service database 36. Once encrypted, the message content
enters the Internet tunnel 41 where it remains in an encrypted
25 format while it traverses the Internet, i.e. until it reaches
the end point 42 located within the secure network (B).

The provision of triggered redirection and, where appropriate,
automatic encryption permits a secure tunnel 41 to be
30 constructed through the usually insecure Internet. From the
end point 42 the message is routed on to switch 18 and
thereafter to the destination end terminal 12. Between the
end terminals 10,12 and their respective access switches (i.e.
the service switching point 32 and the switch 18) in the
35 access networks (e.g. GSM or GPRS) specific encryption or
physical security is used and thereby provides inherent
security within the first and second networks (A) and (B).

Any information held in the service database 36 can be easily
40 modified or changed without down-loading or up-loading to and
from end terminals 10,12. For example modifications can effect

5 updates of stored algorithms/keys or alter group lists to
permit guest users of a subscriber to benefit from the
service. The modifications may be made, for example, via an
intelligent network service management access point (SMAP)
which allows the operator or even the subscriber himself to
10 change the database 36 records constituting the subscriber
profile information as appropriate.

Preferred methods therefore provide a secure method of
communication, wherein triggers set on say originating
15 subscriber identity, destination subscriber number, IP
address, flow ID or payload information can be mapped to
intelligent network service logic available to the subscriber.
Preferred arrangements in effect permit the creation of a
virtual private network (VPN) for communication between the
20 end terminals 10 and 12. Preferred arrangements represent a
triggered intelligent network service on an intermediate-
system (i.e. on a switch/router within a network), rather than
an application based system operating on end terminals. An
advantage is that the same service can be triggered for any
25 subscriber and, if desired, the algorithms or keys used in
encryption can be proprietary to a subscriber. Paying
subscribers can benefit from the advantages, whether they are
in home or visitor networks provided the network operators of
the relevant home and visited networks are party to a roaming
30 agreement.

Individuals or commercial entities who are subscribers and
have paid for specific services will be identified in the
group lists held within the service data base and can benefit
35 from a secure network service customised according to their
own preferences.

Another advantage is that commercial entities or other group
subscribers can define an algorithm to be used exclusively in
40 connections between members of a specific group. That is,
company A could define an algorithm to be used in transfers

5 between employees of company A only; in which case when establishing a connection between company A employees, the service control point 34 would inform the service switching point 32 to forward an encryption algorithm specific to company A to the encryption engine 40.

10

Another advantage is that because handling of encryption is in fact network based there is no need to store encryption or compression algorithms or the like at either of the respective end terminals 10,12.

15

Intelligent network elements 30 can cause encryption keys or even encryption algorithms themselves to be loaded and used at encryption end points associated with the service switching point 32. The encryption engine 40 may, but does not need to be, part of the intelligent network elements 30 served directly by the service switching point 32 which triggers the service. For example, the triggering service switching point 32 may simply redirect packets or flows of a specific subscriber to an encryption engine 40 on a separate network/sub-network, by re-routing to the relevant host in order to enter the encryption engine 40. Of course, a decryption point would still need to be located at the end point 42 or at least within the secure network (B).

30 In one modified version the algorithm is run in a centralised encryption (or compression etc) network element (NE) separate from the service switching point 32 but still within the first network (A). In this case, the service control point 34 returns routing instructions (e.g. a tunnel to the NE) and any encryption parameters to be used in the encryption NE. Corresponding means may be provided within the second network (B) to effect decryption/de-compression of the message.

40 In another modified version, the service is triggered in response to a specific message sent by the source terminal. That is, the service is specifically commanded by the end

5 terminal in communication.

In another modified version, the service switching point 32 may refer to the service control point 34 as a matter of course. (i.e. without a trigger being recognised). The
10 records in the service data base then being accessed by the service control point 34 to determine specific routing instructions and encryption/decryption information.

Where roaming agreements are in place between the operators of
15 networks (A) and (B), corresponding secure network services can be provided on service switching points in the visited network. These service switching points may run algorithms set up in advance through agreement between the network operators or transferred dynamically, for example upon an end terminal
20 attaching to a visited network. Alternatively, distribution of the necessary encryption/decryption information may be achieved via a secure virtual home environment (VHE) mechanism or by a distribution method/arrangement described hereinafter.

25 Figure 3 shows how a roaming agreement set up between the operators of networks (A) and (B) may allow originating end terminal 10 to benefit from the advantages of the preferred method while visiting network (B). End terminal 10 in effect experiences a virtual home environment (VHE) facilitated by
30 secure communications between the network operators party to the agreement. The virtual home environment enables terminal 10 to initiate the normal access 50 and connection set up 52 operations as if it was located in its home network. If the subscriber of end terminal 10 normally benefits from secure
35 network communications provided by his home network operator, a trigger set up using intelligent network elements 60, as mentioned above will be identified in the service switching point 62. If no such trigger is identified the service switching point will route the call via the PSTN 16 or via the
40 Internet 22 non securely. Where a trigger is identified by the service switching point 62, the service control point 64

5 accesses the service database 66 in which the subscriber
profile contains encryption information. According to the
profile information contained in service database 36, in this
example routing information, encryption information and group
subscriber lists, etc., the service control point 64 controls
10 the service switching point 62 to redirect the call in a
secure manner via the Internet 22. As before, the message
would be then redirected to an encryption engine 80 where the
message is encrypted before it enters a tunnel 41 for secure
transfer through the Internet 22 to a secure end point 82
15 within the destination network (A). From this end point 82,
the call is routed via the switch 14 to the destination end
terminal 12. Triggers are available not only in the
originating network on messages from the source terminal but
also in the destination network on messages intended for the
20 destination terminal.

The above type of secure service can be made available
anywhere in the world provided subscribers are visiting areas
covered by roaming agreements with their home network
25 operator. These services can be run from any terminal because
the manner of operation means they are actually effected on
the network. All of the earlier mentioned advantages apply to
such roaming methods.

30 In order for originating and terminating end points to
decipher encrypted (or compressed) data, they must have access
to the relevant decryption (or de-compression) algorithms
and/or keys and be able to run them. In the cases of the
methods of Figures 2 and 3, the encryption end points 40,80
35 and 42,82 need to be provided with the relevant
encryption/decryption information. It is desired that only
those for whom the message is intended can access the
algorithms and/or keys which enable the message to be
deciphered. Moreover, these keys should not be distributed
40 over insecure networks. Where transmission of decryption
information is unavoidable, it should be distributed over

5 networks in a secure manner.

Two trusted network operators such as the operators of the first and second networks (A) and (B) would normally have access to corresponding encryption/decryption keys.

10 Nevertheless, the subscriber may still prefer to pay extra for specific algorithm services which in effect function as an additional layer of encryption or represent a specific tunnel construction. In addition to the Internet 22, insecure intermediate networks may include fixed and mobile networks

15 over which the network operator cannot offer the standard of encryption required. Where this situation occurs, security beyond the basic ciphering provided in for example GSM networks (and future UMTS networks) may be required by network users. When such additional protection is required, the

20 destination end point 42 and/or the destination end terminal 12 must have access to the necessary decryption information which is typically an algorithm or a key. The intelligent triggered method of Figure 4 works by querying a security server connected in an intelligent network as an intelligent

25 peripheral as described below.

Figure 4 schematically shows a preferred method for the distribution of encryption/decryption information. The illustrated network uses an algorithm/key distribution system

30 managed by intelligent network elements 30. The arrangement of Fig. 4 is similar to that of Fig. 2 and like reference numerals indicate like features. A first end terminal 10 wishes to communicate with a second end terminal 12 in a secure manner. The originating end terminal 10 is in a first

35 network (A) controlled by a first network operator and the second end terminal 12 is located in a second network (B) controlled by a second network operator. The networks (A) and (B) may be fixed or mobile networks operated by trusted network operators and are thus deemed relatively secure. In

40 order for the message content to traverse the Internet 22 in a secure manner it will need to be encrypted at or before the

5 tunnel end point defined by encryption engine 40 and decrypted
at or once it has passed end point 42. Thus it is possible
for encryption/decryption to occur at nodes within either of
the networks (A) and (B) (e.g. encryption engine 40 or end
point 42). Alternatively, it is possible for
10 encryption/decryption to occur at the end terminals 10,12,
respectively.

In operation, the end terminal 10 goes through the attach 50
and connection set up 52 procedures which inevitably depend on
15 the type of network. Service switching point 32 handles the
request for communication and, if present, a trigger causes
the service switching point 32 to refer to the service control
point 34. Examples of the various types of trigger set-up
available were mentioned earlier with reference to Figures 2
20 and 3. The SCP 34 provides an intelligent function and can
refer to a subscriber profile in the service database 36. The
subscriber profile provides subscriber specific encryption
information and may also provide routing preferences. The
service control point 34 then communicates with the service
25 switching point 32 to route the transfer either through the
PSTN 16 or via the Internet 22. Where the subscriber profile
in service database 36 specifies encryption, the message is
routed to the encryption engine 40 and onwards to switch 18
via the Internet 22. There is a corresponding end point 42
30 where the message is decrypted within the secure network (B).
It would of course be possible for the relevant decryption to
be performed at the end terminal 12.

An intelligent network service management access point (SMAP)
35 100 allows the operator to alter records in the database 36
and, therefore, specify, load and change the algorithms or
keys to be stored and/or distributed. Accordingly, a given
subscriber can manage his own key hierarchy by instructing the
network operator to make, delete or alter relevant entries in
40 the database 36.

5 Note that the network (A) includes intelligent network
elements 30 and the service database 36 containing security
information managed by the operator of network (A). An
intelligent peripheral could also hold security information
for example, keys. The security information stored in service
10 database 36 might include encryption algorithms, compression
algorithms, keys 39 etc. As before, where this security
information is held within or is associated with a given
subscriber profile, it can be proprietary to a specific
subscriber. A selection of different algorithms or keys may be
15 held in association with a specific group of subscribers.
More than one algorithm/key may be stored in the service
database 36 with the various items being held in a hierarchy
along with specific instructions for use thereof.

20 Preferred network arrangements can be set up to automatically
communicate the particulars of encryption or indeed whether or
not encryption is required at all. Preferred networks can be
set up to ensure decryption algorithm/keys are received by the
or each destination end terminal; either at the same time or
25 at a different time to the message itself. That is, any one
who was targeted as a recipient of a message can automatically
receive the relevant decryption information. As before, the
effect is to create a virtual private network between
communicating end terminals.

30

Where a message is a broadcast message intended for a target
group consisting of a number of end terminals 12, a plurality
of keys 39 can be distributed simultaneously for the plurality
of target end terminals 12. Since the second network (B) is
35 deemed to be secure, it is not necessary for terminating end
terminals 10,12 to run decryption applications nor handle any
type of algorithm/keys at all. Encryption or decryption can be
performed at any secure points within networks (A) and (B)
under the control of the intelligent functions as described
40 with reference to Figures 2 and 3. However, in certain
circumstances it may be that distribution of decryption

5 information for example keys to end terminals is preferred and
this is also possible provided the or each end terminal in
question is provided with the means necessary to run the
decryption application. The distribution of a key need not be
10 triggered specifically by a message content associated with a
call. The intelligent network may, for example, periodically
distribute keys to selected end points or end terminals or in
response to external events. Thus with a preferred network
incorporating an intelligent network function for the
distribution of encryption information, keys can be
15 distributed for any party attached to any point in the network
and the distribution process can be network initiated. That
is network-initiated key up dates can be propagated to secure
end points 42 within the destination network or directly to
end terminals 12 of subscribers between sessions or calls.
20 The network-initiated update may be to the or each user
selectively or it may be to one or more of the operators and
the distribution thereafter managed by the operator.
Similarly, any modifications or changes to algorithms/keys or
the key hierarchy can be specified and transmitted to
25 destination nodes with great efficiency.

The timings of network-initiated key distributions can be
selected to maximise security. For example, the keys may not
be distributed simultaneously with the messages they may be
30 distributed at different predetermined times which may be
regular or irregular times. All of the above services would
be available on a fixed network or on a mobile network and in
the latter case switching on or moving, for example, may be
used as triggers to push encryption information updates around
35 the various networks.

In mobile networks where the originating and/or terminating
end terminal is visiting another operator's network, the
service may be offered in accordance with roaming agreements.
40 Preferably, trusted communications between reputable network
operators will permit a virtual home environment (VHE) to be

5 provided to visiting mobile terminals and, therefore, a
subscriber could have access to the service anywhere in the
world provided the local network is party to such an
agreement. A virtual home environment is facilitated when
information concerning all aspects of the service possibly
10 including encryption/decryption information, is shared between
network operators in a secure manner.

Recipient end terminal users can specify that they wish to
answer calls only according to certain circumstances. For
15 example, they may choose not to answer any calls which are not
accompanied by keys or for which they do not have access to
keys.

Public keys can be securely distributed to target subscribers
20 over usually insecure intermediate networks for use with a
private key service held at a secure location within one of
networks (A) or (B). Alternatively, private keys may be
distributed specifically to the service subscriber for him to
use exclusively in signing certificates or data. This service
25 has obvious advantages over a system in which keys are
distributed in a non-specific manner.

Signed certificate data can be verified by the public key
distributed to other parties needing authentication of the
30 sender. Where public keys are made available by general
broadcast or held at specific sites it is desirable for the
validity of the key to be certified by some authority.
Network operators may authenticate signed data/keys that is,
act as a Certification Authority and, where appropriate,
35 charge for the service.

In cases of secure symmetric encryption, a shared (secret) key
can be distributed for secure sessions between two or more end
terminals 10,12 wishing to form secure connections across one
40 or more usually insecure networks. Secure encryption
techniques are possible because the intelligent network

5 elements 30 and particularly the tunnel entry 40 and tunnel exit 42 end points are located within networks owned by trusted network operators using network specific (e.g. GPRS or GSM) encryption.

10 The intelligent network function for the distribution of encryption information may be provided in originating network (A) or terminating network (B). In fact, one or more intelligent network elements may be provided in both ends of the communication chain. Figure 5 shows an arrangement in

15 which intelligent network elements 60 are provided at the destination end of the communication chain. In order to communicate a message, the end terminal 10 would go through the usual access 50 and connection set up 52 procedures, regardless of whether the switch 14 in network (A) is in fact

20 a telecommunication switch, an MSC or a type of intelligent network element. Assume also that switch 14 is operable to direct the transfer via the Internet 22 in an encrypted form. The message would thus be routed to a first tunnel end point, in this case defined by encryption engine 40. The exit to the

25 tunnel 41 is defined by a second tunnel end point 42 from where the message is routed to intelligent network elements 60.

When the message reaches the group of intelligent network

30 elements 60 it is received by service switching point 62. If a trigger has been set up and is identified, the service switching point 62 refers to the service control point 64. SCP 64 provides an intelligent function and accesses the service database 66 to get information on the algorithm or key

35 relevant to the message in question. Information in the service database 66 can be associated with the message by any suitable means, e.g. by the ID of the originating subscriber or the destination number. In fact, the trigger may operate in response to any address message, ID, IP address, flow ID or

40 payload information etc. The relevant encryption information, in this case key 69, is transmitted back to the service

5 control point 64 and then on to the service switching point 62
for transfer directly to the destination end terminal 12.

All advantages described in relation to the method of Figure
4 also apply here. For example, subscribers are able to
10 control and manage their own key hierarchy in the same way as
described with reference to Figure 4.

Clearly, the or each group of intelligent network elements
30,60 providing the triggering and distribution functions can
15 be positioned at any convenient point in the communication
chain, provided that the chosen location is one within the
secure networks. Further, the elements of the or each group of
elements 30,60 providing the trigger (recognition) and
distribution functions, namely the service switching points
20 32,62 and the service control points 34,64 need not be in the
same part of the distribution chain. That is, a first group
of intelligent network elements 30 in network (A) can instruct
a second group of intelligent network elements 60 in network
(B) to distribute a key (or algorithm) to one or more
25 destination end terminals 12.

Where added encryption is required on usually secure networks
(e.g. PSTN 16), it is possible to provide an arrangement
wherein the necessary encryption/decryption means 40,42 are
30 provided in the communication chain at either end of the PSTN
16 network or on the end terminals 10,12.

Short message services (SMS) could be used to deliver keys.
However, under short message service conditions nothing would
35 be automatic, i.e. the key would not necessarily be received
when the call is received in which case it would need to be
requested subsequently. Short message service delivery may not
always be possible if the receiving party is analogue mobile
or fixed telephone. Preferred embodiments are therefore most
40 effective when used with fixed or mobile terminals whereas GSM
mobile has the additional option of SMS services.

- 5 Under certain circumstances, it may be preferable for the security information such as keys to be delivered on control channels rather than on user channels.

10 The schematic illustrations of preferred embodiments are not intended to limit the invention to one or more of the specific arrangements disclosed herein. For example, the or each of the network elements for performing the invention may be provided in any suitable arrangement(s) and one or more is likely be provided in different hierarchical layers of the
15 relevant telecommunication network.

CLAIMS:

5 1. A secure network arrangement for communication between
a first end terminal located in a first secure network and a
second end terminal located in a second secure network, said
first and second networks being separated by a relatively
insecure intermediate network, the secure network arrangement
10 including:

one or more network elements triggerable to selectively
route a communication from the first end terminal to the
second end terminal over said relatively insecure intermediate
network; and

15 an encryption engine for encrypting said selectively routed
communication before it traverses said intermediate network,
wherein said one or more network elements and said
encryption engine are located substantially within said first
secure network.

20 2. A secure network arrangement according to claim 1,
wherein said one or more network elements comprise a switch
means provided with a control means and a storage means for
storing routing and encryption/decryption information.

25 3. A secure network arrangement according to claim 2,
wherein the switch means is operable selectively route a
predetermined type of communication according to routing
information held in the storage means and the encryption
30 engine is operable encrypt said selectively routed
communication according to encryption information held in said
storage means.

35 4. A secure network arrangement according to claim 3,
wherein said predetermined types of communication are
identified by means of one or more of the following:
originating subscriber characteristics; destination subscriber
characteristics; payload characteristics or network service
characteristics.

5 5. A secure network arrangement according to claim 4,
 wherein said predetermined types of communication are
 identified by means of the originating or destination address.

 6. A secure network arrangement according to claim 4,
10 wherein said predetermined types of communication are
 identified by means of originating identification or
 destination numbers.

 7. A secure network arrangement according to claim 2,
15 wherein the routing information and encryption/decryption
 information specifies operations according to subscriber
 preferences.

 8. A secure network arrangement according to claim 7,
20 wherein the encryption/decryption information defines a
 preferred algorithm or key for use with said predetermined
 types of communication.

 9. A secure network arrangement according to claim 2,
25 wherein the information held in the storage means identifies
 one or more groups of users whose communications are to be
 routed and encrypted according to common preferences.

 10. A secure network arrangement according to any preceding
30 claim, comprising a service management access point for
 accessing and changing information held in the storage means.

 11. A secure network arrangement for communication between
 a first end terminal located in a first secure network and a
35 second end terminal located in a second secure network, said
 first and second networks being separated by one or more
 intermediate networks at least one communication route through
 which constitutes a relatively insecure communication route
 from the first end terminal to the second end terminal, the
40 secure network arrangement including one or more network
 elements triggerable to selectively route a communication from

5 the first end terminal to the second end terminal over said relatively insecure intermediate network; and

an encryption engine for encrypting said selectively routed communication before it traverses said intermediate network, wherein said one or more network elements and said encryption
10 engine are located substantially within said first secure network.

12. A secure network arrangement according to any preceding claim, including decryption means located substantially within
15 the second secure network.

13. A secure network arrangement according to claim 12, wherein said decryption means are provided at the second end
20 terminal.

14. A secure network arrangement according to claim 12, wherein said decryption means are provided at a node other than the second end terminal.

25 15. A method for secure communication between a first end terminal located in a first secure network and a second end terminal located in a second secure network, said first and second networks being separated by a relatively insecure intermediate network, the method including the steps of
30 providing:

one or more network elements triggerable to selectively route a communication from the first end terminal to the second end terminal over said relatively insecure intermediate network; and

35 an encryption engine for encrypting said selectively routed communication before it traverses said intermediate network, wherein said one or more network elements and said encryption engine are located substantially within said first secure network.

40

16. A method according to claim 12, wherein said one or

5 more network elements is provided with means to store decryption information and is triggerable to distribute the decryption information to one or more target nodes in the second secure network.

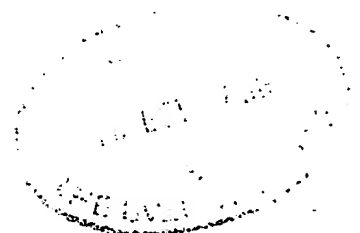
10 17. A method according to claim 15, wherein there is further provided in said second secure network one or more network elements operable to store encryption/decryption information and triggerable to distribute the encryption/decryption information to one or more target nodes
15 in the second secure network.

18. A method according to any one of claims 15-17 provided to a subscriber located in a visited network by virtue of a roaming agreement.

20 19. A method according to any one of claims 15-18, wherein there is provided decryption means located substantially in said second network.

25 20. A method according to claim 19, wherein the decryption means is provided at a node other than the second end terminal.

30 21. A method according to claim 19, wherein the decryption means is provided at the second end terminal.



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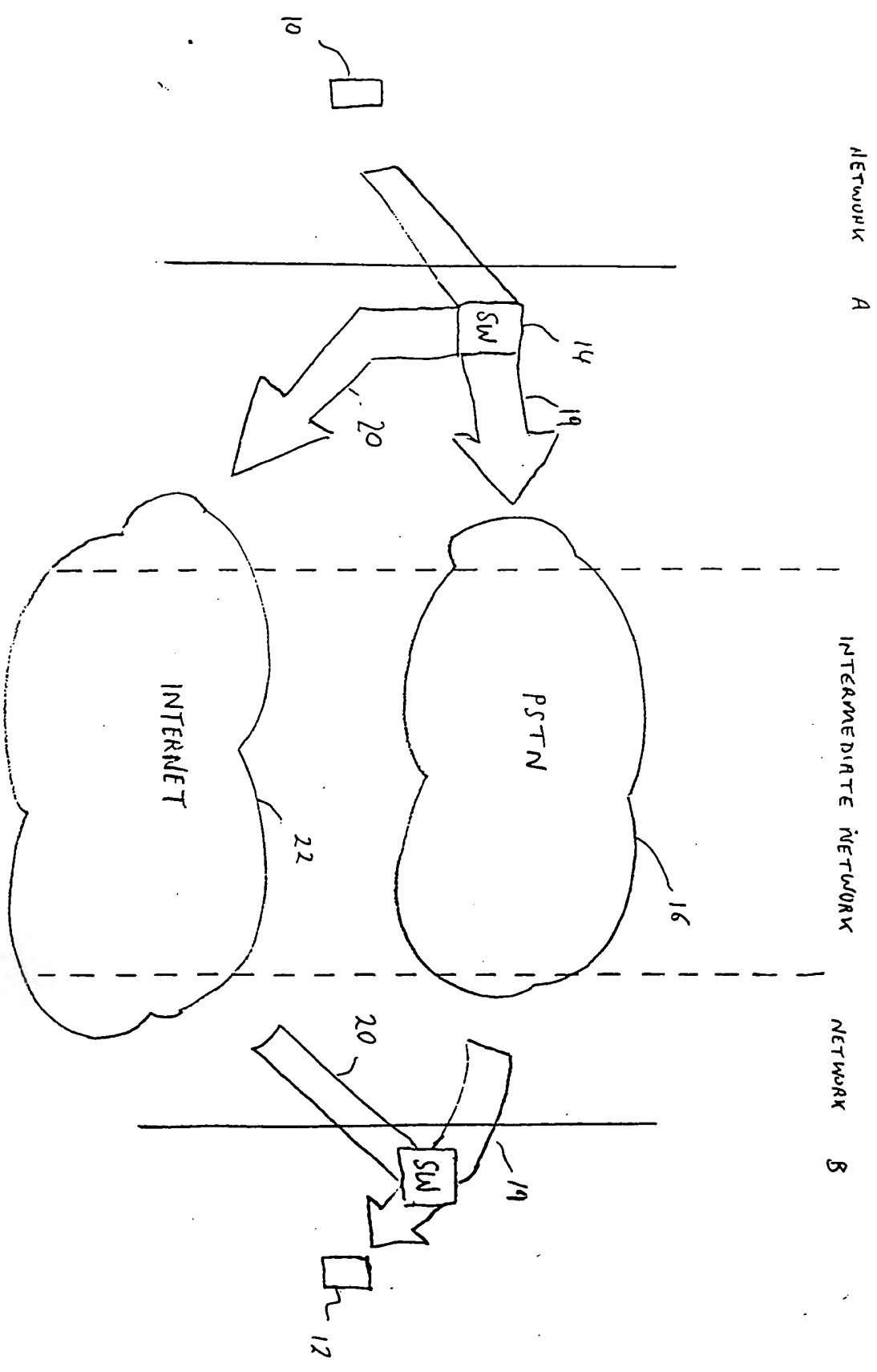
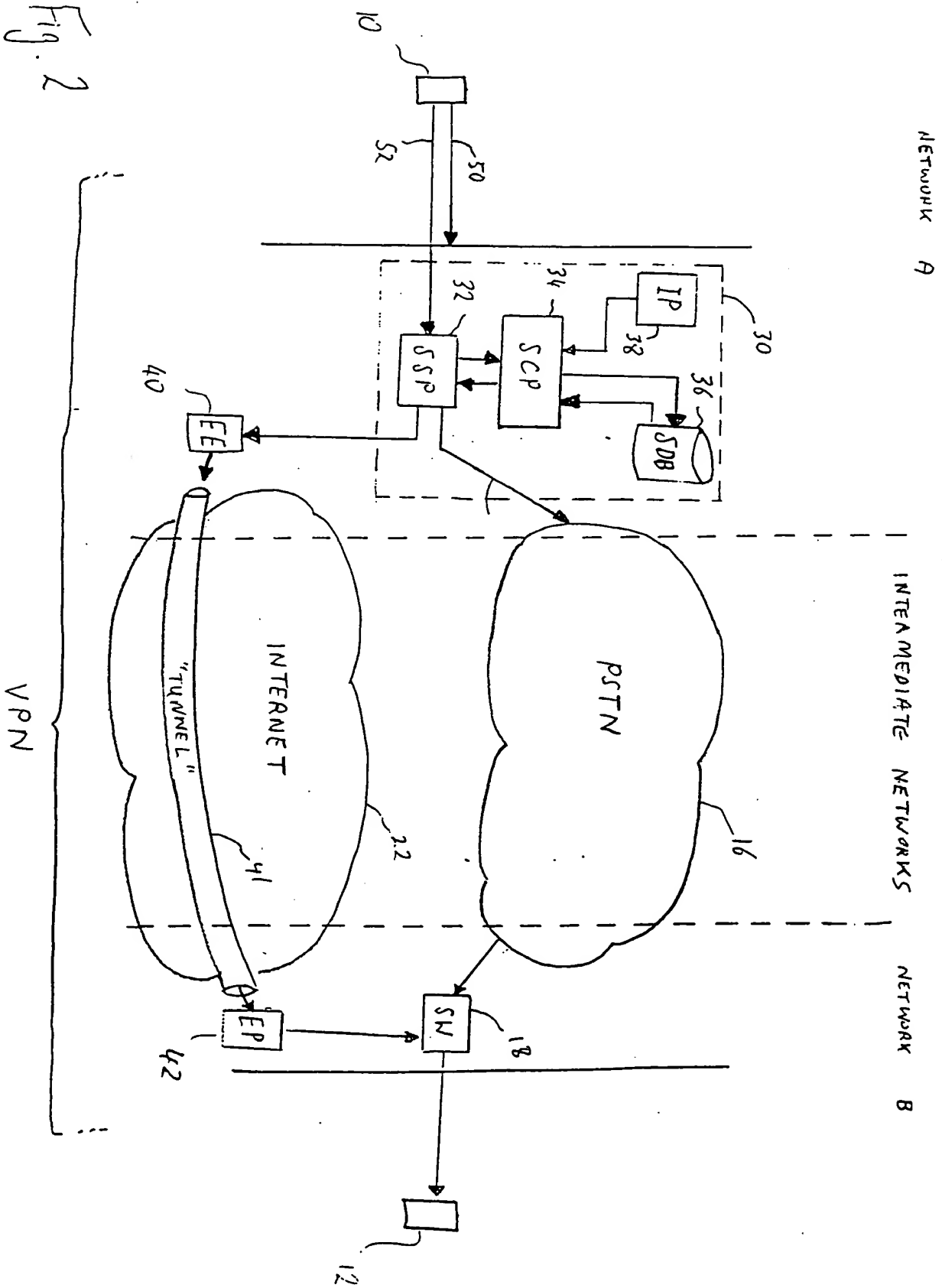


Fig. 1

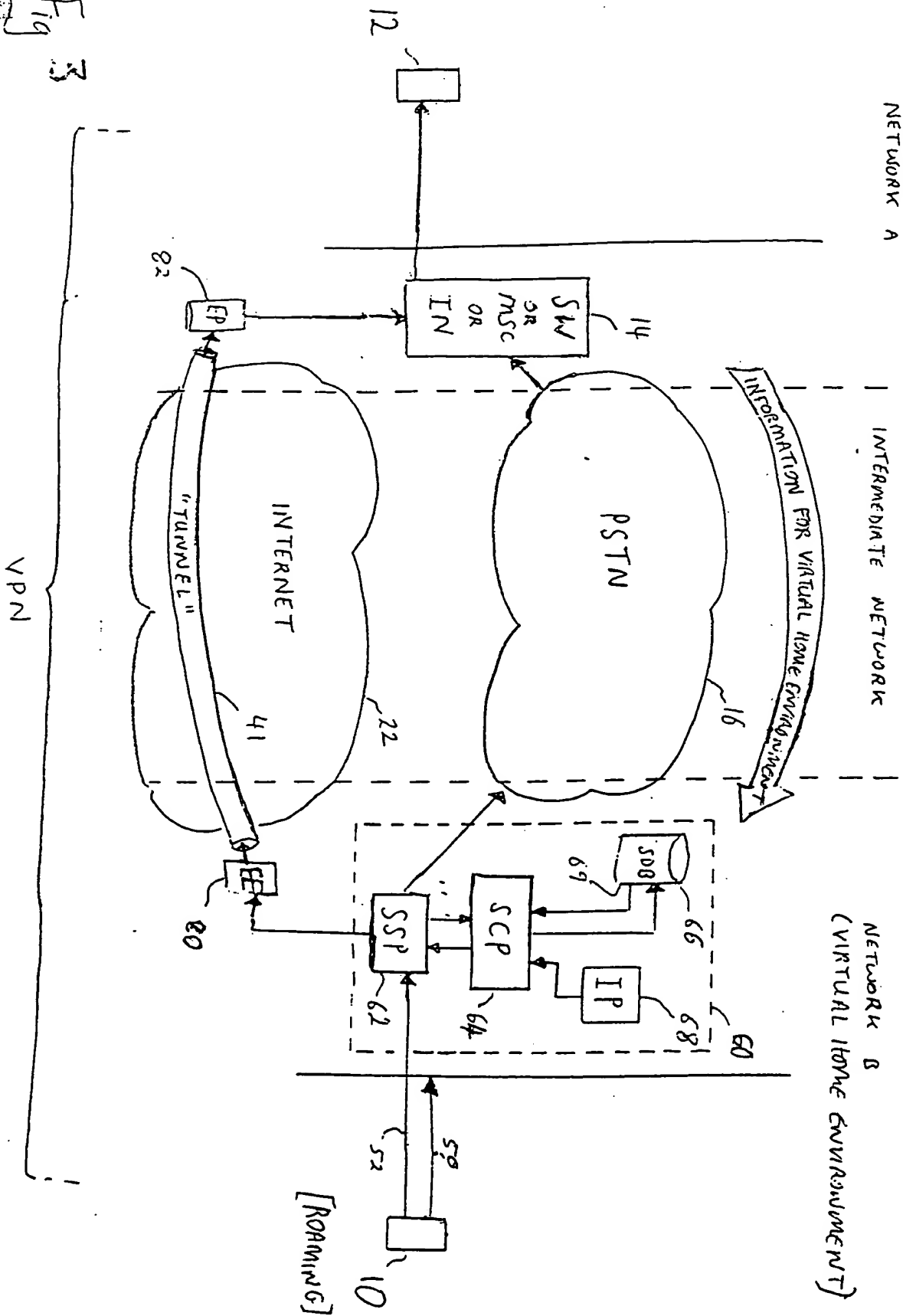
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Fig. 2



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Fig 3



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NETWORK A

INTERMEDIATE NETWORK

NETWORK B

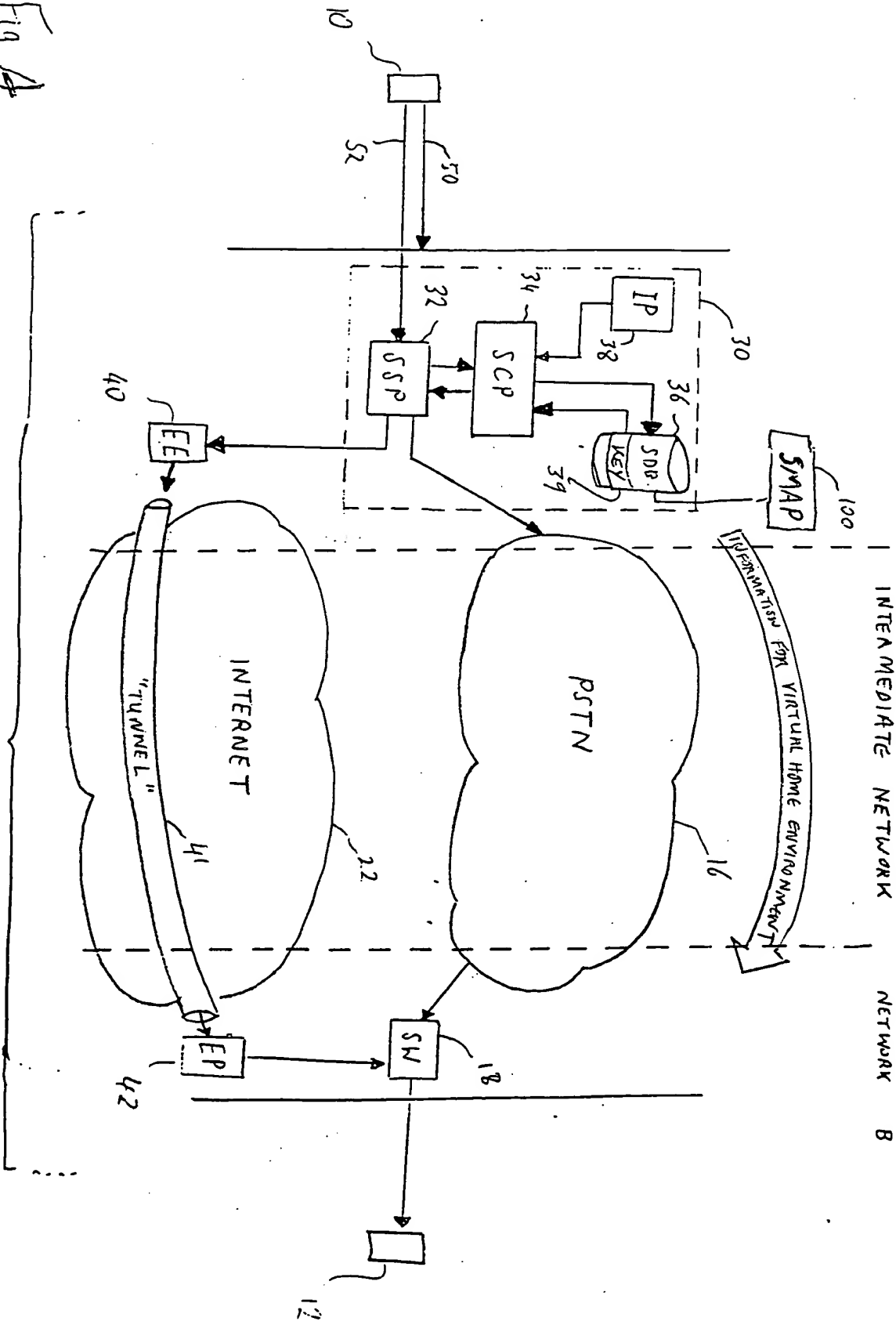
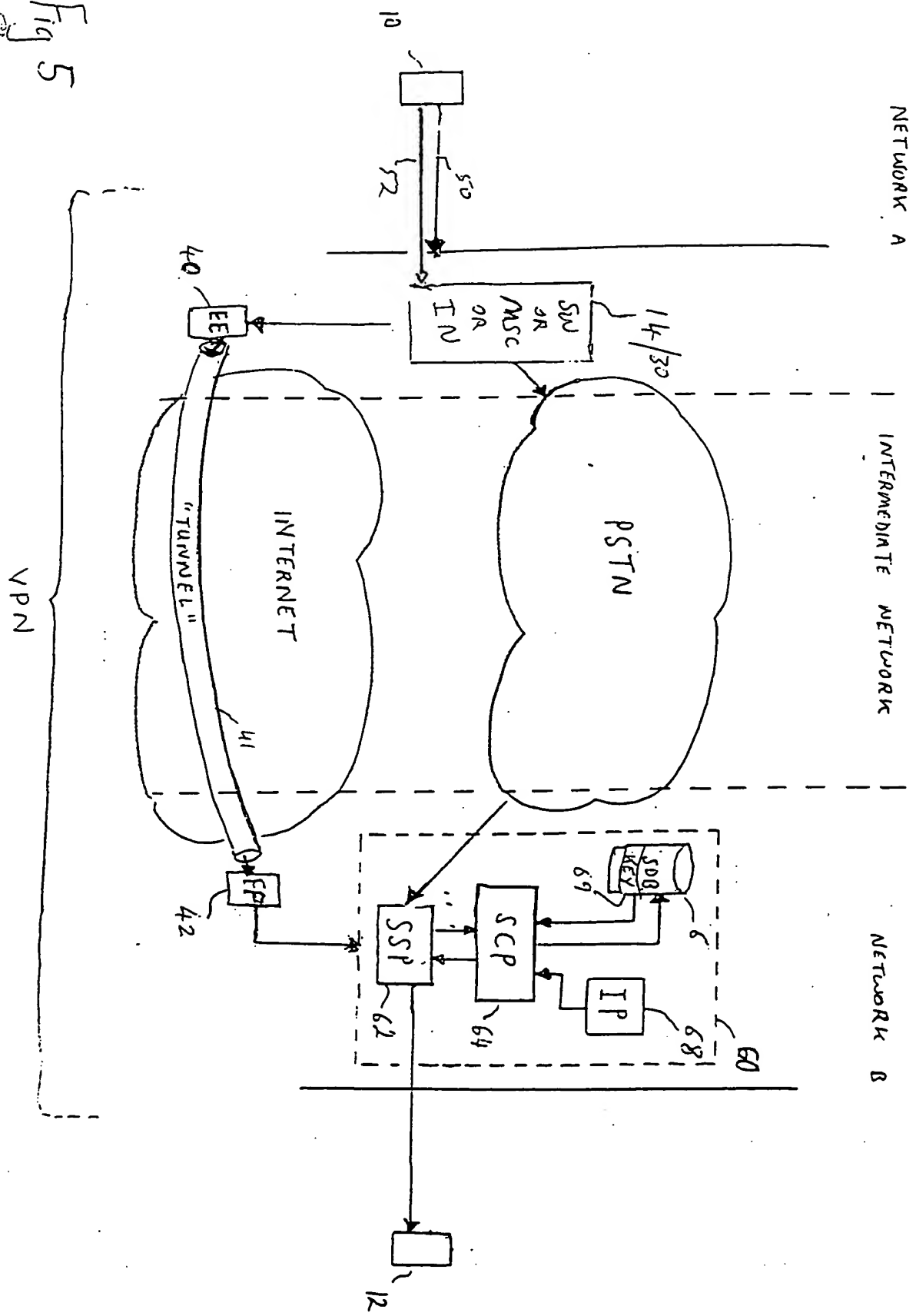


Fig. 4

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Fig 5



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